

Industry, university and government partnership to address research, education and human resource challenges for nuclear industry in Canada

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This paper describes the outcome of an important recent initiative of Canadian nuclear industry to reinvigorate interest in education and collaborative research in prominent Canadian universities. This initiative has led to the formation of the University Network of Excellence in Nuclear Engineering (UNENE), incorporated in 2002.

During the recent past, the slowdown in nuclear power development in Canada has curtailed the demand for new nuclear professionals down to a trickle. Without exciting job opportunities in sight the interest of prospective students in nuclear education and research has plunged. Consequently, with declining enrolment in nuclear studies and higher demand from competing disciplines, most universities have found it difficult to sustain nuclear programs. As such the available pool of graduating students is small and insufficient to meet emerging industry demand.

With nuclear industry employees' average age hovering around mid-forties and practically no younger cohort to back up, nuclear industry faces the risk of knowledge loss and significant difficulty in recruiting new employees to replenish its depleting workforce. It is, therefore, justifiably concerned. Also, since nuclear generation is now the purview of smaller companies, their in-house capability for mid- to longer-term research is becoming inadequate.

Recognizing the above challenges, Ontario Power Generation, Bruce Power and Atomic Energy of Canada Limited have formed an alliance with prominent Canadian universities and undertaken to invest money and offer in-kind support to accomplish three main objectives:

- Reinvigorate university-based nuclear engineering research by augmenting university resources by creating new industry supported research professorships and supporting research of other professors.
- Promote enrolment in graduate programs by supporting students and making use of a course-based Master of Engineering (M.Eng.) Program that is taught collectively by professors from all supported universities and which can be completed through part-time studies.
- Create a pool of nuclear expertise in universities that can be accessed by public and governments for impartial and trustworthy advice.

The Canadian Nuclear Safety Commission (CNSC), the Canadian Regulator, and Candu Owners Group are also participating in UNENE activities.

Nuclear industries have linked with a select group of Canadian universities agreeable to committing to nuclear research and education and seeking investment from governments to match cash and in-kind contributions from industry.

The University Network of Excellence in Nuclear Engineering (UNENE) was thus created involving universities of McMaster, Queen's, Toronto, Waterloo, Western Ontario and the new University of Ontario Institute of Technology. These universities are recipients of funds for setting up NSERC-UNENE Industry Research Chairs in Nuclear Engineering. Also, Ecole Polytechnique and the University of New Brunswick, supported respectively by Hydro Quebec and New Brunswick Power, and Royal Military College - operating a joint graduate program with Queen's University, are participants in UNENE.

The following Industrial Research Chairs are either in place or approved to start within the next few months. In each case there is a provision for hiring a junior Research Chair.

- Dr. John Luxat, Nuclear Safety Analysis and Thermal Hydraulics, McMaster University
- Dr. Rick Holt, Advanced Nuclear Materials, Queen's University
- Dr. Roger Newman, Nano-Engineering of Alloys for Nuclear Power Systems, University of Toronto
- Dr. Mahesh Pandey, Risk-Based Life Cycle Management of Engineering Systems, University of Waterloo
- Dr. Jin Jiang, Control, Instrumentation and Electrical Systems of Nuclear Power Plants, University of Western Ontario.

Progress is being made to find a candidate and define a research program for an Industrial Research Chair:

- Knowledge Management, University of Ontario Institute of Technology.

Each of the above six NSERC-UNENE Industrial Research Chairs are tenured positions, funded at \$2.0 M or more for first five years. The Chairs may be subsequently renewed. A large number of graduate students are already enrolled with Professors Holt, Jiang and Pandey.

In anticipation of receiving Ontario Council of Graduate Studies accreditation for the course-based M. Eng. Degree in Nuclear Engineering, the following courses have already been offered to a typical class of 20 students.

- Reactor Physics
- Nuclear Plant Systems and Operations
- Nuclear Reactor Safety Design
- Thermal Hydraulics

In addition to these, courses to be offered in near future include: Engineering Risk Analysis; Reactor Chemistry and Corrosion; Nuclear Materials; Control, Instrumentation and Electrical Power Systems; Nuclear Waste Management; Fuel Management; Health Physics/Radiation Protection; Power Plant Thermodynamics; Codes, Standards and Jurisdictions; and Business Management.

M.Eng. courses are delivered in flexible format to suit distant faculty and part-time students.

UNENE, an industry driven partnership of nuclear industry, universities and governments, created to address the future challenge of research, education and human resources in Canada, has made an impressive start.